Claims

[c1] 1. A multiple channel array coil for magnetic resonance imaging (MRI), comprising:

a plurality of conductive strips, formed within a dielectric medium, said plurality of conductive strips further being arranged into a generally cylindrical configuration; and

each of said plurality of conductive strips having a length (l), said length being selected to cause each of said strips to serve as a resonator at a frequency corresponding to a proton MRI frequency;

wherein said generally cylindrical configuration of said plurality of conductive strips thereby forms a multiple channel, volume resonator in which each of said conductive strips is isolated from the remaining conductive strips.

[c2] 2. The array coil of claim 1, further comprising a generally cylindrical radio frequency (RF) shield surrounding said generally cylindrical configuration of conductive strips, said RF shield serving as a ground plane for said conductive strips.

[c3] 3. The array coil of claim 1, wherein l is selected to create a quarter wavelength ($\lambda/4$), standing wave resonator.

[c4] 4. The array coil of claim 1, wherein l is selected to create a half wavelength ($\lambda/2$), traveling wave resonator.

[c5] 5. The array coil of claim 1, wherein 16 conductive strips are used to form a 16-channel array coil.

[c6] 6. A multiple channel transceiver array for magnetic resonance imaging (MRI), comprising:

a generally cylindrically shaped volume resonator, said resonator further comprising a set of individual conductive strips configured as resonators at a proton MRI frequency;

a power splitter for splitting power from an input RF power source to each of said individual conductive strips; and

a phase shifter, coupled to said power splitter, said phase shifter configured to

provide a sinusoidal current distribution between said individual conductive strips in said volume resonator.

[c7] 7. The transceiver array of claim 6, wherein said phase shifter further comprises individual phase shifting elements capable of selectively adjusting the phase of a corresponding one of said conductive strips.

[c8] 8. The transceiver array of claim 7, further comprising:
a plurality of attenuators, coupled between said power splitter and said individual phase shifting elements, said plurality of attenuators configured for individually adjusting the amplitude of input RF current applied to said individual conductive strips; and
a plurality of amplifiers, coupled to outputs of said individual phase shifting elements, said plurality of amplifiers for amplifying input RF power applied to each of said individual conductive strips.

[c9] 9. The transceiver array of claim 6, further comprising a generally cylindrical radio frequency (RF) shield surrounding said cylindrically shaped volume resonator, said RF shield serving as a ground plane for said conductive strips.

[c10] 10. The transceiver array of claim 6, wherein each of said conductive strips has a length l, wherein l is selected to create a quarter wavelength (λ /4), standing wave resonator.

[c11] 11. The transceiver array of claim 6, wherein each of said conductive strips has a length l, wherein l is selected to create a half wavelength (λ /2), traveling wave resonator.

[c12] 12. A magnetic resonance imaging (MRI) system, comprising:
a computer;
a magnet assembly for generating a polarizing magnetic field;
a gradient coil assembly for applying gradient waveforms to said polarizing magnetic field along selected gradient axes; and
a radio frequency (RF) transceiver array for applying RF energy to excite nuclear spins of an object to be imaged, and for thereafter detecting signals generated by excited nuclei of said object to be imaged, said RF transceiver array further

comprising:

a generally cylindrically shaped volume resonator, said resonator further comprising a set of individual conductive strips configured as resonators at a proton MRI frequency;

a power splitter for splitting power from an input RF power source to each of said individual conductive strips; and

a phase shifter, coupled to said power splitter, said phase shifter configured to provide a sinusoidal current distribution between said individual conductive strips in said volume resonator;

wherein signals detected by said transceiver array are processed by said computer to produce MR images of said object to be imaged.

[c13] 13. The MRI system of claim 12, wherein said phase shifter further comprises individual phase shifting elements capable of selectively adjusting the phase of a corresponding one of said conductive strips.

[c14] 14. The MRI system of claim 13, further comprising:

a plurality of attenuators, coupled between said power splitter and said individual phase shifting elements, said plurality of attenuators configured for individually adjusting the amplitude of input RF current applied to said individual conductive strips; and

a plurality of amplifiers, coupled to outputs of said individual phase shifting elements, said plurality of amplifiers for amplifying input RF power applied to each of said individual conductive strips.

[c15] 15. The MRI system of claim 12, further comprising a generally cylindrical radio frequency (RF) shield surrounding said generally cylindrically shaped volume resonator, said RF shield serving as a ground plane for said conductive strips.

[c16] 16. The MRI system of claim 12, wherein each of said conductive strips has a length l, wherein l is selected to create a quarter wavelength (λ /4), standing wave resonator.

[c17]

17. The MRI system of claim 12, wherein each of said conductive strips has a length l, wherein l is selected to create a half wavelength (λ /2), traveling wave

resonator.

[c18] 18. A method for generating a homogeneous radio frequency (RF) excitation field for magnetic resonance imaging (MRI), the method comprising:
configuring a generally cylindrically shaped volume resonator, said resonator further having a set of individual conductive strips implemented as resonators at a proton MRI frequency; and
inputting RF power to a phase shifter, said phase shifter configured to provide a sinusoidal current distribution between said individual conductive strips in said volume resonator;
wherein said individual strips in said volume resonator are internally decoupled from one another.

[c19] 19. The method of claim 18, further comprising:
surrounding said generally cylindrically shaped volume resonator with a generally cylindrical radio frequency (RF) shield, said RF shield serving as a ground plane for said conductive strips.

[c20] 20. The method of claim 19, further comprising selecting a length /for said conductive strips to create a quarter wavelength (λ /4), standing wave resonator.

[c21] 21. The method of claim 19, further comprising selecting a length /for said conductive strips to create a half wavelength (λ /2), traveling wave resonator.

[c22] 22. The method of claim 19, wherein 16 conductive strips are used to form a 16-channel array coil.

[c23] 23. A method for generating a homogeneous radio frequency (RF) excitation field for magnetic resonance imaging (MRI), the method comprising:
configuring a generally cylindrically shaped volume resonator, said resonator further having a set of individual conductive strips implemented as resonators at a proton MRI frequency; and
inputting RF power to a phase shifter, said phase shifter configured to provide an initial sinusoidal input current distribution between said individual conductive strips in said volume resonator;

determining the homogeneity of a resulting RF excitation field from said initial sinusoidal current;

determining one or more corrective adjustments to be applied to said phase shifter if the application of said initial sinusoidal current does not result in a desired homogeneity for said resulting RF excitation field; and

selectively adjusting one or both of a current amplitude and a phase for one or more of said conductive strips.

[c24] 24. The method of claim 23, further comprising:

surrounding said generally cylindrically shaped volume resonator with a generally cylindrical radio frequency (RF) shield, said RF shield serving as a ground plane for said conductive strips.

[c25] 25. The method of claim 24, further comprising selecting a length *l* for said conductive strips to create a quarter wavelength (λ /4), standing wave resonator.

[c26] 26. The method of claim 25, further comprising selecting a length *l* for said conductive strips to create a half wavelength (λ /2), standing wave resonator.